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(54) **Chewing gum including cacao bean husk extract**

(57) A chewing gum for inhibiting glucan synthesis and thus combating tooth decay having included therein, an extract for cacao bean husk and; a method of producing such a chewing gum, comprising extracting water soluble components from cacao bean husk and blending said components into the gum.

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A CHEWING GUM

DESCRIPTION

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The present invention relates to a chewing gum for inhibiting tooth decay, which chewing gum includes a soluble extract of cacao bean husk.

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More particularly, the present invention relates to a chewing gum blend including a soluble extract of cacao bean husk having a biologically active component, which prevents tooth decay by blocking the synthesis of insoluble glucan (plaque).

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Tooth decay is becoming more wide spread as a result of increased sugar consumption. Glucan is created from sugar by bacteria which reside in the oral cavity and the glucan forms into plaque attached to the surface of the teeth. The teeth are decayed by the activity of those bacteria which live in such plaque.

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Dextranase and mutanase are enzymes which decompose glucan and have been used to combat tooth decay. In the chewing gum industry, chewing gum for preventing tooth decay is now being produced and tested. In such
5 chewing gum, sugar is replaced by other sweetening materials and, dextranase and mutanase are blended into the gum.

Recently, however, a biologically active substance,
10 mutastein, which inhibits glucan synthesis from sugar, has been isolated from Streptococcus mutans, a bacteria existing in the oral cavity (Japanese Patent Publication 57-146587). This substance inhibits tooth decay by a different mechanism to that of the present
15 invention.

The present inventors investigated the potential of cacao (Theobroma cacao) bean husk as a tooth decay inhibitor. Cacao bean husk is normally wasted, though
20 its seeds are used all over the world as a raw material in the production of chocolate. It was found that a soluble extract of cacao bean husk has a remarkable ability to inhibit the synthesis of insoluble glucan and subsequent plaque formation.

Thus, by blending this extract, which inhibits glucan synthesis, into chewing gum, the object of providing a chewing gum which inhibits tooth decay is achieved.

5 Accordingly, the present invention provides a chewing gum for inhibiting glucan synthesis, characterised, by having included therein, an extract from cacao bean husk.

10 In a further aspect, the present invention provides a method of producing such a chewing gum characterised by comprising, extracting water soluble components from cacao bean husk, preferably by aqueous extraction and, thereafter, blending said components into the gum.

15 The extract of cacao bean husk used in the present invention may be obtained from minutely ground, dried cacao bean husk. Extraction may be carried out in a normal way, using water or ethyl alcohol and,
20 preferably, the resulting extract is freeze-dried, after the raw solution has been collected and concentrated by vacuum evaporation.

The inventive chewing gum may be obtained by adding the extract of cacao bean husk together with spices to the gum blend, during an otherwise conventional gum manufacturing process.

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The added extract may include an extract of water, an extract of ethyl alcohol, a precipitate of ethyl alcohol and a precipitate of ammonium sulfate.

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Preferably, the extract is added to chewing gum at a concentration of 0.1-1.0%. Examples 1-5 illustrate methods of preparing extracts from cacao husk, for incorporation into chewing gums in accordance with the present invention.

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Example 1

20g of completely dried cacao bean husk is ground minutely, 1 liter of water is added thereto and, the resulting mixture is heated at 80°C in water for 30 minutes. The process is repeated three times and the resulting solution is filtered. Thereafter, the

product is concentrated by vacuum evaporation, followed by freeze drying.

5 The resulting extract amounts to 22% of the original dried cacao bean husk.

Example 2

10 20g of completely dried cacao bean husk is ground minutely, and its fatty components are removed in 500 ml of hexane. A mixture of water and ethyl alcohol (50:50) is then added to the husk. Then, it is continuously extracted for 2 hours. As in Example 1, the whole extract is filtered.

15

After concentration by vacuum evaporation, the product is freeze dried. The resulting extract amounts to about 27% of the original dried cacao bean husk.

20 Example 3

10g of the extract obtained by Example 1 are dissolved completely in 500ml of distilled water and, a precipitate obtained by adding cooled ethyl alcohol to

the resulting solution, in a ratio of 2.5 volumes of alcohol to 1 of water, is collected by centrifugation. Then, it is freeze dried.

5 Example 4

A precipitate obtained by adding 60% of ammonium sulfate($(\text{NH}_4)_2\text{SO}_4$) solution instead of the ethyl alcohol in Example 3, is collected by centrifugation
10 and dissolved in 50 ml of distilled water, its salt is removed by dialysis. Then, the product is freeze dried.

Test for inhibition of glucan synthesis

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The extracts produced by examples 1-4 are each diluted in distilled water to 10% concentration. The samples are then further diluted, to provide test samples for use in determining the extent to which the synthesis of
20 insoluble glucan by glucosyltransferase, with sucrose as a substrate, is blocked by the extracts.

For each sample, 0.8 ml of 1.25% sucrose solution
(containing 0.0025% sodium azide) prepared with a
buffer solution (pH 6.5) of 65mM calcium phosphate,
0.02ml of glucosyltransferase and 0.18ml of the test
5 sample are put into a test tube. After mixing, the
contents of each tube are allowed to react at 37°C for
16 hours at a slope of 30 degrees. After reaction, the
solution contained in each test tube is thrown away and
glucan attached to the surface of its wall cleaned with
10 distilled water.

After the glucan is made to disperse into 3 ml of
distilled water by ultrasonic agitation, the absorbance
at 550nm is measured with a spectrophotometer. The
15 results are shown in Table 1. The control is processed
in the same way as the test samples, but 0.18 ml of
distilled water is used in place of a diluent of an
extract.

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Table 1

Extract(0.2% concentration)	Absorbance at 550nm
Control	1.558
Example 1 extract	0.022

Example 2 extract	0.018
Example 3 extract	0.048
Example 4 extract	0.084

- 5 Gums in accordance with the present invention have been prepared with the following formulations:-

(Embodiment 1)

10	Gum base	20-30%
	Palatinose	62%
	Sorbitol	6%
	Copper chlorophyll	0.007%
	Peppermint flavour	2.47%
15	An extract prepared as set out in example 1	0.2%

(Embodiment 2)

20	Gum base	20-30%
	Sorbitol	68%
	Copper chlorophyll	0.007%
	Peppermint flavour	2.47%

An extract prepared as set
out in example 1

0.2%

(Embodiment 3)

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Gum base	20-30%
Sorbitol	5.8%
Sucrose	62%
Copper chlorophyll	0.007%
Peppermint flavour	2.47%

10

An extract prepared as set
out in example 1

0.2%

(Embodiment 4)

15

Gum base	20-30%
Palatinose	29%
Sorbitol	38%
Copper chlorophyll	0.007%
Peppermint flavour	2.47%

20

An extract prepared as set
out in example 1

0.2%

The gums in accordance with the above formulations were prepared using the normal methods and processes used in the chewing gum manufacturing industry.

- 5 In addition to being active in combating tooth decay, chewing gums in accordance with the present invention have a pleasant flavour as a result of their incorporation of cacao bean husk extract.

CLAIMS

1. A chewing gum for inhibiting glucan synthesis,
5 characterised by having included therein, an extract
from cacao bean husk.
2. A method of producing a chewing gum for
inhibiting glucan synthesis characterised by
10 comprising, extracting water soluble components from
cacao bean husk and, thereafter, blending said
components into the chewing gum.
3. A method as claimed in Claim 2 characterised in
15 that the cacao bean husk is dried and subsequentially
ground, prior to extraction.
4. A method as claimed in Claim 2 or 3 characterised
in that said components are extracted into water, or a
20 water and alcohol solution.
5. A method as claimed in Claim 4 characterised in
that, prior to extraction, the cacao bean husk is
treated with a non-water miscible solvent, to remove
25 fatty components from the husk.

6. A method as claimed in either Claim 2, or Claim 3, characterised in that alcohol is added to the aqueous extract, in a sufficient quantity in order to cause the required water soluble components to precipitate.

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7. A method as claimed in either Claim 2, or Claim 3, characterised in that ammonium sulfate solution is added to the aqueous extract and the desired water soluble components are caused to precipitate.

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8. A method as claimed in Claim 7 characterised in that the precipitate is redissolved in water.

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9. A method as claimed in Claims 2-8, characterised in that the water soluble components are concentrated by vacuum evaporation and, subsequently, freeze dried.

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10. A method as claimed in Claim 2 characterised in that aqueous extraction is carried out at 80°C.

11. A method as claimed in Claim 4 characterised in that the water and alcohol are present in said solution, in a ratio of 1:1.

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12. A method as claimed in Claim 6 wherein 2.5

volumes of alcohol are added to 1 volume of aqueous extract.

5 13. A method as claimed in any of the preceding Claims characterised in that the alcohol is ethyl alcohol and the non water miscible organic solvent is hexane.

14. A chewing gum produced by a method as claimed in any of Claims 2-13.

10

15. A chewing gum as claimed in Claim 14 characterised by comprising between 0.1% and 1.0% by weight of the components extracted from cacao bean husk.

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16. A chewing gum substantially as hereinbefore described, with reference to examples 1-4 and embodiments 1-4.

20 17. A method substantially as hereinbefore described, with reference to examples 1-4 and embodiments 1-4.